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patronage of Edinburgh Royal Botanical Gardens to the Crown, and to unite the Regius professorship and the University professorship of botany.

DISCUSSION AND CORRESPONDENCE.

THE BRUCE ASTRONOMICAL MEDAL.

TO THE EDITOR OF SCIENCE: Miss Catherine Wolfe Bruce, of New York city, to whom astronomy all over the world is indebted for liberal and intelligent benefactions, proposes to found a gold medal to be awarded not oftener than annually by the Astronomical Society of the Pacific for distinguished services to astronomy. The medal is to be international in character and may be given to citizens of any country and to persons of either sex. The design for the obverse of the medal is the seal of the Astronomical Society of the Pacific. The medal is to be 60 mm. in diameter. The reverse is to bear this inscription: "This medal founded A. D. MDCCCXCVII. by Catherine Wolfe Bruce is presented to—(name)—for distinguished services to Astronomy—(date)."

The Astronomical Society regularly awards also a bronze medal founded in 1890, by the late Joseph A. Donohoe, for the discovery of each unexpected comet.

EDWARD S. HOLDEN.

LICK OBSERVATORY.

PROFESSOR SCOTT'S BIRD PICTURES.

IN *Scribner's*, for April, Professor W. E. D. Scott 'scores the conventional method of bird-stuffing, and furnishes eight pictures of birds which are stuffed according to his own ideas.' Now, Professor Scott speaks from long experience, and what he says is largely, but by no means wholly, to the point, for much of our museum work is undoubtedly bad. Whether or not the pictures which illustrate the article and are held up as examples for us to follow are any great improvement over our more recent bird work is very questionable. It might seem ungracious to criticise these pictures of stuffed birds, but when our attention is called to them by aggressive italics and special postal cards criticism would seem to be invited. It therefore becomes a painful duty to say that the Clapper Rail and Robin are certainly not in conven-

tional attitudes and that aside from these at least three of the birds are decidedly faulty, these, moreover, being birds with which Professor Scott should be most familiar. The Bittern, p. 503, is so poised that he seems about to topple over backward, while his neck and free foot are both wrong. Ward's Heron, p. 501, and the Little Blue Heron, p. 502, both have curves in their necks which, from the structure of their backbones are *physically impossible*. The shape and articulation of the neck vertebrae of herons is such that they *always* have more or less of an angular bend in their necks, whether these be extended vertically or doubled upon themselves, and failure to reproduce this very characteristic feature means failure to convey a correct idea of a heron. We may accept Professor Scott's strictures, but we decline to follow his models.

F. A. LUCAS.

NOTE ON A SIMPLE METHOD FOR NEWTON'S TOTAL REFLECTION EXPERIMENT.

DEMONSTRATORS who have written for their fellows seem to have overlooked the fact that Newton's beautiful experiment, showing that for any pair of media each color having its own index of refraction has, therefore, its own critical angle, may be exhibited by much more simple and inexpensive means than the four prisms usually required for that purpose.

All that is really necessary beside the lantern or other means for getting a strong sharp parallel beam is a refraction tank, such as Wright's, having glass ends. If this tank is set up in the path of the beam in such a manner that the light may be made to pass obliquely upward into the water as for total reflection it will be found that, by adjusting the depth of the water in the tank and the angle of incidence of the beam, the apparatus can be so arranged that only red rays will emerge, all others being totally reflected. Now, by diminishing the angle of incidence of the pencil on the air surface, tilting the mirror if one is used, the remainder of the spectrum may be brought in order out of the water, and, by reversing the operation, sent back again totally reflected. Just as in the demonstration in which the right-angled prisms are employed, the image of the

slit formed by that portion of the pencil which at every incident angle undergoes reflection is tinted by the rays so sent back.

As in all such work, the sharper the beam the better the results, but I find the experiment succeeds very well indeed with the beam obtained by projecting with the ordinary optical front a narrow slit in the stage of my electric lantern.

F. W. MCNAIR.

MICHIGAN MINING SCHOOL.

SCIENTIFIC LITERATURE.

Annual Report of the Geological Survey of Canada for the Calendar Year 1894. G. M. DAWSON, C. M. G., LL. D., F. R. S., Director.

This volume is No. 7 of the New Series of Reports of the Canadian Survey, and comprises 1,206 pages, accompanied by eleven maps, fifteen plates and diagrams, besides figures in the text. It is a storehouse of facts relating to the geology of all parts of the Dominion, and is the first of the reports prepared by the guiding hand of the new Director.

The staff of this organization, including all employees, professional and ordinary, numbers fifty-one persons, and the total amount, expended sum up \$110,000 for the fiscal year ending June 30, 1894. The several reports are, first a summary of all the operations by the Director; then an account of the geology of the Kamloops map-sheet in British Columbia, by Dr. Dawson; an exploration of the Finlay and American rivers in the north part of the same province, by R. S. McConnell; preliminary report upon the south part of the district of Keewatin, by D. B. Dowling; the geology of the southwest sheet of the eastern townships, by R. W. Ells and F. D. Adams; the surface geology of eastern New Brunswick, northwestern Nova Scotia and a portion of Prince Edwards Island, by R. Chalmers; upon the chemistry and mineralogy, by G. C. Hoffmann; upon mineral statistics and mines for 1893 and 1894, by E. D. Ingall and H. P. H. Brumell, and many paleontological notes interspersed here and there by J. F. Whiteaves and H. M. Ami.

Out of such a mass of information one can only refer to matters in which he is most interested.

At Athabasca landing, near the Canadian Pacific Railway, a trial boring has been effected to the depth of over 1,000 feet for petroleum. Beds of soft Cretaceous sandstones from 140 to 225 feet in thickness, for a distance of ninety miles along Athabasca river, are more or less saturated with bitumen. It is believed that the petroleum occurs in Devonian strata, which in the neighborhood underlie the Cretaceous. As the tar sands proved to be somewhat thicker than was expected, and various difficulties arose, partly in connection with the large supplies of gas exhaled, operations had not been completed at the time the report was made; and it was thought it would be necessary to continue this boring five hundred feet further before abandoning the location. The probabilities seemed ample for expecting the development of another oil field in this district.

The statistics of production of valuable minerals give a total value of \$20,950,000 for the year 1894, which is a slight falling off from the yield of the previous year. The more valuable products in the order of their importance are coal, nickel, bricks, building stone and gold, the last having the value of \$1,042,055. British Columbia produced the most, \$456,066, followed closely by Nova Scotia. The Columbian mines are almost entirely worked in placers of Pliocene age, derived from auriferous veins in the Carboniferous and Triassic rocks. Dr. Dawson states that "British Columbia has now fairly entered on a period of rapid and thorough development of its mineral resources."

Perhaps with the idea of promoting this development, large space is given to the description of the geology of the Kamloops sheet, with a map descriptive of an area about eighty miles square, just above the latitude of 50° and comprised between longitudes 120° and 122°, through which the Canadian Pacific Railway takes its course. The aggregate thickness of the formations in this field is 79,500 feet. The Archean is wanting, though present just to the east of longitude 120°. The Cambrian consists of two parts: the lower, or *Nisconlith* series—dark argillites; and the upper, or *Adam's Lake* series—volcanic beds with arkose conglomerates; both amounting to 11,500 feet. The Silurian and Devonian have not